

WHY HOUSEHOLD ELECTRIFICATION IN RWANDA OUTPACED PAPUA NEW GUINEA (2000-2025)

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CASE STUDY COMPARABILITY

In the early 2000s:

- Rwanda & PNG among world's least electrified countries with access rates around 10% of the population;
- Relatively small populations (less than 10 million) and relatively small grid systems (less than 1,000MWs);
- Hydro power accounted for around two-thirds of capacity in both countries;
- Neither had made significant investment in electricity production, both seeing post-independence deterioration especially in rural areas;
- In the late 1990s, both underwent a similar process of partial electricity sector privatization, ending the monopoly on power generation previously held by state-owned utilities by opening production to private suppliers;
- Shortly after, both set similarly ambitious electrification goals, targeting 70 percent access in PNG (2010) and 100 percent in Rwanda (2030).



CASE STUDY COMPARABILITY

In pursuit of these goals, the two countries faced similar challenges:

1. Remoteness from global markets increasing the transactional costs of transport and trade required to expand energy infrastructure;
2. Heavily rural societies, with between 80 to 90 percent of their respective populations living in rural areas, further increasing costs of electrification.

And yet...



FROM 2000-2025...

Rwanda

- 12-fold increase in total installed capacity from 27MW to 320MW;
- 41 new plants comprised 31 hydro (totalling 107MW), three diesel (59MW), two peat (85MW), two methane (30MW), and three solar (12MW);
- 25% of households electrified through off-grid connections, mostly hundreds of thousands of solar home systems but also some hydro and solar mini-grids and pico-grids.

PNG

- 65 percent increase in total installed capacity across the country's three grid networks from 367MW to 605MW;
- Six new plants comprised two gas (104MW), two hydro (76MW), and two diesel (59MW);
- Off-grid subsector largely neglected, with solar home systems or mini-grids failing to gain traction and hardly present in rural areas.



Access to electricity (% of population) - Rwanda, Papua New Guinea

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Why, from similar starting points and facing comparable challenges, did Rwanda and Papua New Guinea experience such sharply divergent electrification outcomes?





DATA COLLECTED

- Government, development agency & private sector documents, national media archives (248 total);
- Interviews in both countries with representatives from range of energy institutions, including state agencies, donors, investors, firms, development banks (38 total).





CORE ARGUMENT

Two factors are highlighted as decisive:

1. Opposing political settlements led to contrasting levels of statecraft and ideational commitment oriented towards the pursuit of household electrification;
2. A sector-specific suite of derisking measures encouraged investment in Rwanda while a lower level of risk mitigation deterred investment in PNG.

BUT...



I. OPPOSING POLITICAL SETTLEMENTS & RULING IDEOLOGIES

- Rwandan Patriotic Front (RPF) in power for more than 30 years, strong and unitary state, power heavily centralized, high level of bureaucratic effectiveness in policy design and implementation;
- Frequent transitions of power in PNG, fragmented state, power decentralized, lower level of bureaucratic effectiveness in policy design and implementation;
- (Pre-colonial and colonial histories and continuities not insignificant);
- Senior RPF figures in Rwanda long committed to energy expansion as national priority, as part of broader social contract with population.

IN RWANDA, POLITICAL SUPPORT FOR ELECTRIFICATION TRANSLATED INTO STRONG POLICY COORDINATION & BUREAUCRATIC EFFICIENCY

- 2008, Rwandan Ministers of Finance and Energy established the Energy Access Roll-Out Program;
- Closely monitored by Presidency through annual leadership retreats, and Ministry of Finance and Economic Planning conducted annual reviews;
- 2009-24, mobilised more than \$1.4 billion from different partners for electrification, providing counter-funds of up to 10% through state-owned utility REG and reinjecting connection fees into the programme;
- *Imihigo*: The setting of clear performance targets, reviewed annually, a critical component of rapid household electrification programme;
- In the financial year 2019-20, REG signed to deliver 16 individual outputs and four joint outputs, including increased electricity generation and increased electricity access, of which 19 were achieved.



IN PNG, LACK OF ELITE COHESION & COMMITMENT TO ELECTRIFICATION FED INTO POLICY INERTIA

- Rise of PNG's fossil fuel sector in 2000s and 2010s led to competing energy coalitions and ideational visions for the sector's development, reflected in contradictory policy ambitions;
- While the National Electrification Roll-Out Plan was first envisioned in the 2011 Electricity Industry Policy, it wasn't until 2022 that it was finally approved, nearly 15 years after the comparable plan was launched in Rwanda.

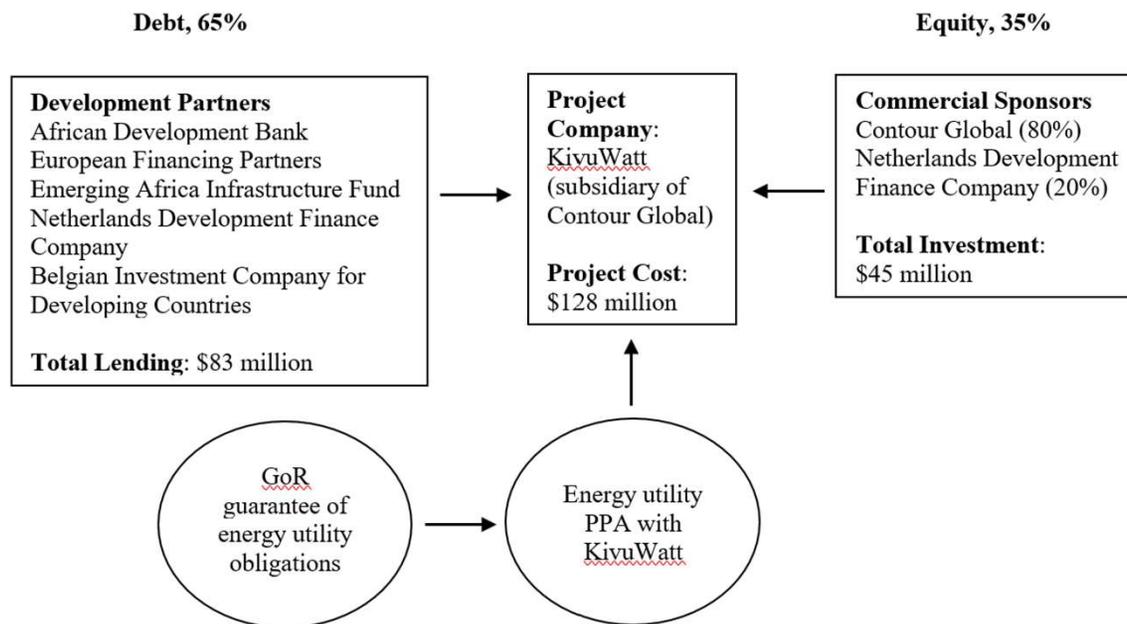


II. THE DE-RISKING RWANDAN STATE

Since 2000s, all new grid-connected energy projects developed through 25-year power purchase agreements:

1. Feed-in-tariff regime locks a fixed, long-term price for electricity generated & commits to purchasing delivered power, shielding investor from price volatility;
2. Denominates tariff in US dollars, shielding investor against local currency depreciation;
3. Provide state guarantee to pay if energy utility defaults or becomes insolvent.

Figure 1: Derisking structure of KivuWatt methane power plant



Source: Adapted from AfDB (2013, p. 65)



THE DE-RISKING RWANDAN STATE

Early 2010s, set up risk-mitigation facility for off-grid solar:

1. Exempt from sales tax and import duty;
2. Results-based financing up to 70% of capital expenditure for mini-grid developers;
3. Concessional lending and direct financing;
4. Solar home system subsidies, paying solar firms directly up to 90% of sale price depending on household income category.



BUT...

- Installed generation capacity in Rwanda today far exceeds annual demand;
- Yet nearly 2/3s of electricity production was contracted through PPAs with a “take-or-pay” clause, meaning 90% of electricity provided must be paid for, even when not consumed;
- Increased electricity generation has locked the country into high energy costs (linked to fact that low tariffs struggle to attract investment) and spiralling debt for next two decades;
- Fiscal pressure heightened by Rwandan francs’ 50% depreciation against the US dollar over last five years (recall, derisking denomination of all PPAs in US dollars).





CONCLUDING THOUGHTS FOR PNG

- Rwanda's de-risking model has delivered rapid results but at the cost of longer-term energy sovereignty, energy affordability, and policy space more broadly;
- Off-grid solar would seem to avoid many of the issues arising through larger grid projects; likely scope for more policy replicability here to support off-grid solar rollout.